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REVISED FLARE MONITORING AND RECORDING PLAN

SUMMARY: Modification to facility's Rule 1118 Flare Monitoring and Recording Plan to change Condition 12 to allow the facility (for the LPG flare only) to use a UV pilot flame scanner for pilot flame detection rather than a thermocouple.

COMPANY INFORMATION:

Company Name: Ultramar Inc. Valero Wilmington Refinery, Facility ID 800026
Mailing Address: 2402 East Anaheim Street, Wilmington, CA 90744-4081
Equipment Location: 2402 East Anaheim Street, Wilmington, CA 90744-4081
Contact Person: Jon Elliott, (562) 491-6797

FEE EVALUATION:

The BCAT for this revision to the Rule 1118 Flare Monitoring and Recording Plan is 666056 (Flare Monitoring & Recording Plan), Schedule C. Fees of \$684.57 were paid when the application was submitted. Additional fees of \$6,785.77 are due for the additional 57 hours spent evaluating this application.

BACKGROUND:

The Ultramar Valero refinery in Wilmington, California (herein referenced as the Valero Wilmington refinery) operates four (4) flares that are subject to the requirements of Rule 1118. These 4 flares make up two separate flare systems within the refinery. The first system consists of three elevated flares (Phase 0, Phase 1 and Phase 2) that are classified as general service flares. These three flares (or their associated flare gas recovery systems) normally receive vent gases from designated areas of the refinery but can also operate as an integrated system whenever there is an emergency due to an electrical power outage or an inoperable vapor recovery system. The second system consists of one elevated flare (the 'LPG' flare) which operates by itself to serve the refinery LPG storage and loading unit exclusively. The LPG flare is designated as a clean service flare based on the fixed composition of the liquefied petroleum gas this flare services.

The District amended Rule 1118 on November 4, 2005 in an effort to further control and minimize flare emissions. Stricter requirements for monitoring, recordkeeping, and reporting of flare activities were imposed in this latest rule amendment in order to better quantify flare emissions. The Wilmington refinery is an affected facility subject to the provisions of paragraph (f) of Rule 1118. As such, a revised Flare Monitoring and Recording Plan was required to be submitted to the District by 6/30/06 for approval pursuant to Rule 1118(f)(1)(A). This revised plan, along with supplemental information submitted by the facility, met all revised Rule 1118 requirements, and was approved on May 26, 2010 (A/N 458530). A subsequent revision, which allowed the facility the flexibility to submit alternate calculation plans during acid gas flaring

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events (A/N 532523), was found to meet all Rule 1118 requirements and was thus approved on April 17, 2012.

The objective of this permit action is to modify the approved plan by making a change to Condition No. 12, which currently states:

12. The owner/operator shall monitor the flares at all times for presence of a pilot flame using a thermocouple that will alarm the owner or operator in the event of a flame out. The owner/operator shall re-ignite the pilot immediately after a pilot flame out occurs.

This condition currently prevents the facility from using an alternative to a thermocouple for pilot flame detection. Rule 1118 specifies the requirements for pilot flame monitoring in 1118(g)(6): "Monitor the presence of a pilot flame using a thermocouple or any other equivalent device approved by the Executive Officer to detect the presence of a flame."

The LPG flare (C400) is subject to flare monitoring requirements in 40CFR60 Subpart A, which are documented in the facility permit via Condition D12.8: "The operator shall install and maintain a(n) thermocouple or any other equivalent device to accurately indicate the presence of a flame at the pilot light. The operator shall also install and maintain a device to continuously record the parameter being measured." {§60.18(f)(2)}

Note that this federal regulation does not require approval of an alternative to a thermocouple for monitoring the presence of a pilot flame, but Rule 1118 requires prior approval for any alternative to a thermocouple.

With the change to Condition 12 described below (with underlines showing new text), the facility has the option to use a UV pilot flame scanner in place of a thermocouple. Note that the use of a UV pilot flame scanner is approved for the LPG flare (C400) only.

12. The owner/operator shall monitor the flares at all times for the presence of a pilot flame using thermocouples for Phase 0, Phase 1 and Phase 2 flares, and a UV pilot flame scanner for the LPG flare, that will alert ~~alarm~~ the operator in the event of a flame out. The owner/operator shall re-ignite the pilot immediately after a pilot flame out occurs.

Detailed information on other (unchanged) aspects of this Rule 1118 Flare Monitoring & Recording Plan are included in the engineering evaluation file for previously approved A/Ns 458530 and 532523.

MONITORING AND COMPLIANCE HISTORY:

Construction of the LPG flare was completed on July 18, 1989. The LPF flare originally used thermocouples as the pilot flame detection system. The thermocouples were found to have malfunctioned on December 18, 2003; December 24, 2003; April 2, 2004; and April 6, 2004. Ultramar decided to install an ultraviolet (UV) pilot flame scanner for pilot flame detection as a result of these malfunctions. The UV pilot flame scanner was installed on January 18, 2005.

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The root cause of the thermocouple malfunctions is not known, but the most common cause of thermocouple failure is believed to be flame envelopment, which is a function of time and flame exposure. Based on available maintenance documents, the thermocouples used in the LPG Flare experienced a life expectancy of 1-2 years.

One of the key benefits of the UV pilot flame scanner was the fact that it could be installed at grade, a safe distance from the LPG flare (but with a clear line of sight to the flare). This allows maintenance personnel to have access to the scanner without requiring a flare turnaround. Thermocouples are installed inside the flare stack, and safe access to them for repair or replacement requires that the LPG flare be taken out of service. Since the LPG flare operates independently of the other refinery flares, there is not a backup flare available to service the LPG storage area of the facility. The ability to repair or replace the UV pilot flame scanner without requiring shutdowns prevents significant amounts of flaring.

After successful operation of the UV pilot flame scanner was demonstrated, the thermocouples were taken out of service on September 22, 2008. Ultramar did not seek prior approval before taking the thermocouples out of service. An NOV (P61000) was issued July 18, 2012 for failure to monitor the presence of a pilot flame using a thermocouple as required in Condition 12 of the facility's approved Flare Monitoring and Recording Plan. The objective of this permit action is to resolve this outstanding NOV by seeking approval for the facility's existing UV pilot flame scanner.

In 2011, Ultramar discovered that the UV pilot flame scanner had been providing faulty data for the period between June 4, 2010 and May 21, 2011. Air Quality Notification Report No. 276741 provides the following details:

“According to Mr. Smith, on 5/21/11 at around 1930 hours, one of their operators noticed that there was no pilot flame in the LPG Flare (Device ID #C400). Operators were able to relight the pilot flame at 2110 hours that night. Mr. Smith was not made aware of the incident until 5/23/11 at 0900 hours.

“Upon learning of the incident, Mr. Smith stated that he reviewed the flame scanner data to verify the actual start date and time of the loss of pilot flame incident. Mr. Smith discovered that the flame scanner was not in operation from 6/4/2010. Plot of the flame scanner data showed activity until 6/4/10 then flat lined at “zero” from then on. Mr. Smith further stated that the flame scanner alarm had been going off since 6/4/10 but it was overlooked by operators in the control room. Mr. Smith added that no one in their Environmental Department reviewed the flame scanner data until the loss of pilot flame incident occurred.”

The notification report further notes that the LPG Flare video monitor recordings were ultimately accessed to identify when the loss of the pilot flame occurred. Conservatively, the facility reported that the loss of pilot flame started on 5/18/11 at 0615 hours. The LPG Flare had no pilot flame for approximately 3 days and 14 hours.



The flame scanner was ultimately removed from service and sent to the manufacturer for repair. After installation of a new internal circuit breaker, the UV pilot flame scanner was placed back in service on May 26, 2011. An NOV (P53542) was issued May 27, 2011 for this period of lost monitoring data, and has been settled.

Ultramar recognized that the flame scanner operation and data were not reviewed in a timely manner, which would have identified the malfunction sooner. As a preventative measure, an additional flameout alarm was installed in the central control room that instructs the board operator to notify the Environmental Department immediately when the flame scanner signal is less than 25%. The new audible alarm will automatically generate a daily status report which is sent to the Environmental Department and refinery management for review. Operations procedures have been updated to improve Operator knowledge of the flame scanner requirements, and the flame scanner was added to the preventative maintenance schedule. In addition, Ultramar has purchased a backup flame scanner unit that is stored in the warehouse to minimize any future downtime related to malfunctioning flame scanner equipment.

EVALUATION OF EQUIVALENCE OF UV SCANNER AND THERMOCOUPLE:

Table 1. UV Pilot Flame Scanner Data Summary

Quarter*	# of Hours Flameout was Indicated	% of Total Monitoring Time Flameout was Indicated
08Q4	5.7	0.3%
09Q1	1.6	0.1%
09Q2	18.5	0.9%
09Q3	154.8	7%
09Q4	320.2	15%
10Q1	633.5	29%
10Q2	180.5	8%
10Q3	na	na
10Q4	na	na
11Q1	na	na
11Q2	na, 1**	0.12%**
11Q3	0	0%
11Q4	0	0%
12Q1	0.1	0.004%
12Q2	0	0.001%
12Q3	0	0%

* One quarter is typically 2160 hours

** One hour of flameout was indicated during the 852 hours in the quarter with valid data.

The facility provided data from the LPG Flare UV Pilot Flame Scanner for the period from 4th Quarter 2008 to third quarter 2012. Table 1 has a summary of the number of hours a flameout was indicated during each quarter. The data provided is derived from the 4-20mA signal based on the intensity of the ultraviolet scanner. This signal is scaled to 1-100%, with any data below 25% conservatively indicating a flameout. It is noted that a representative from the scanner's manufacturer, Mr. Lalit Mehta, Honeywell representative for the California region, characterized the low range of the scanner as no flame at 0%, an unstable flame from 1-24% (present, but momentarily changing direction, reducing the intensity value), and at 25% and above, a stable flame is present. The facility selected 25% as a conservative warning to provide early indication of the

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possible loss of the pilot flame.

It is not entirely clear whether the downtimes indicated an actual loss of pilot flame or a malfunction of the UV pilot flame scanner. The period from 2010Q3 to 2011Q2 indicate when the scanner was not operational. The significant amounts of pilot flame downtime reported in 2009Q3, 2009Q4, 2010Q1 and 2010Q2 are difficult to identify as flameouts vs scanner malfunctions that culminated in the downtime that began 2010Q3.

For the purpose of this evaluation of equivalence of the UV scanner and thermocouples, and given the facility's enhanced monitoring of all periods of reported flameout and availability of a backup scanner system, this assessment of equivalence will focus on the last two years of data (from May 26, 2011 to September 30, 2012).

During the most recent 5 1/3 quarter monitoring period, the average flameout time reported was only 0.01% of the total monitored time (1.1 hours flameout per 11,652 hours monitored).

The facility provided information on notifications submitted for the 1.1 hours of flameout that indicated that these periods represent the UV pilot flame scanner correctly identifying periods of flame out. On May 20, 2011, the pilot flame was lost for approximately one hour due to a faulty pressure regulator on the pilot gas system. On June 23, 2012, a breakdown was reported due to an electrical malfunction at the LPG flare air blower that caused a momentary (1 minute) loss of pilot flame. The remaining 8 minutes of reported pilot flame failure occurred for either only one minute (4 times) or for two consecutive minutes (twice). This means that only 8 minutes (0.001% of monitored time) presented ambiguous data on the pilot flame status.

The facility originally installed a single UV pilot flame scanner, and operation thus far has confirmed that a single scanner has sufficient field of view and sensitivity to accurately monitor the presence of a flame even under abnormal atmospheric conditions including, but not limited to high winds, sunlight, fog and rain. The sensitivity of the scanner has been set to allow these atmospheric conditions to reduce, but not eliminate the flame signal.

The facility has noted that they would reassess the need for multiple pilot flame scanners if, at some future time, conditions are identified that would lead to an inability of a correctly-operating flame scanner to monitor the presence of a pilot flame.

In addition, the facility has procedures in place, in the event of any equipment malfunction, to replace or repair the equipment on an emergency basis (priority 1 work request). The facility has a backup flame scanner and parts available onsite to expedite any needed repairs in the event of a malfunction.

The recent UV pilot flame scanner performance, coupled with the facility's renewed commitment and enhanced monitoring abilities, indicates that the UV pilot flame scanner may be considered as an equivalent device to a thermocouple with regard to the monitoring of flameouts at the LPG flare.

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RECOMMENDATIONS:

This revision to Condition 12 of the approved Flare Monitoring and Recording plan does not propose any changes that would alter the plan's compliance with Rule 1118 (f)(3) requirements for such plans. Therefore, the plan is recommended for approval with the following conditions:

1. The owner/operator shall perform monitoring and recording of the operating parameters for the following flares in accordance with this approved compliance plan and other applicable requirements of Rule 1118(g). The monitoring and recording shall be performed at all times except when the flare monitoring system is out of service for reasons described in Rule 1118(g)(5)(A).

Flare	Phase 0	Phase 1	Phase 2	LPG
Service Type	General	General	General	Clean

2. A flare event occurs when the flow velocity of vent gas in a flare equals to 0.10 feet per second or greater. The flare event ends when the flow velocity drops below 0.12 feet per second. The owner/operator may use monitoring records of the flare water seal level and closures of control valves to demonstrate that no more vent gas was combusted in the flare for the purpose of determining when the flare event ends.
3. A flare event lasting 24 hours or less shall be considered a single flare event even when the vent occurs in two consecutive days. When a flare event continues for more than 24 hours, each calendar day shall be a separate flare event.
4. The continuous HHV analyzer, total sulfur analyzer and gas flow meter used in this flare plan shall meet the requirements of Rule 1118 Attachment A and shall be certified by the AQMD. The owner/operator shall also comply with the requirements specified in the Quality Assurance and Quality Control Plan (QAQCP) approved by the AQMD on November 2009 for the flare monitoring equipment.
5. When the maximum range of a flow meter is exceeded, the flow rate shall be assumed to be the maximum design capacity of the flare.
6. Volumetric flow rates of vent gases shall be corrected to standard conditions of 14.7 psia and 68°F.
7. Whenever the flow meter, HHV and/or TSC analyzer(s) is down due to breakdowns or maintenance, the owner or operator shall use the data substitution method referenced in Attachment B of Rule 1118 to calculate and report flare emissions. Analyzer(s) downtime shall be limited pursuant to Rule 1118(g)(5)(A).
8. The owner/operator shall calculate emissions of criteria pollutants from each flare and each flare event using the methods described in Attachment B of Rule 1118.



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9. For the Phase 0 flare only, emissions calculations for acid vent gas from the Sulfur Recovery Unit shall be calculated using a default total sulfur concentration of 95% (950,000 ppmv) and HHV of 615 Btu/scf in lieu of analyzer results or sampling, unless an alternate method per Rule 1118 Attachment B, Section (2)(c)(ii) is approved by the Executive Officer to be representative of the total sulfur concentration of the vent gas. An acid vent gas flare event occurs whenever control valve 40-PV-28 is not in the closed position. A valve position indicator shall be maintained to continuously monitor the valve's open or close position.
10. The owner or operator shall install and maintain a flow meter to monitor and record the pilot and purge gas flow to the general service flares.
11. For the LPG flare only, the pilot gas and purge gas flow shall be based on the maximum design capacity of 390 SCFH each.
12. The owner/operator shall monitor the flares at all times for the presence of a pilot flame using thermocouples for Phase 0, Phase 1 and Phase 2 flares, and a UV pilot flame scanner for the LPG flare, that will alert ~~alarm~~ the operator in the event of a flame out. The owner/operator shall re-ignite the pilot immediately after a pilot flame out occurs.
13. The owner/operator shall notify the Executive Officer within one hour of any unplanned flare event with emissions exceeding either 100 pounds of VOC or 500 pounds of sulfur dioxide, or exceeding 500,000 standard cubic feet of flared vent gas. The owner/operator shall also notify the Executive Officer by telephone at least 24 hours prior to the start of a planned flare event with emissions exceeding either 100 pounds of VOC or 500 pounds of sulfur dioxide, or 500,000 standard cubic feet of combusted vent gas.
14. The owner/operator shall conduct a Specific Cause Analysis for any flare event, excluding planned shutdown, planned startup and turnaround, resulting in any of the followings: (a) 100 pounds of VOC emissions. (b) 500 pounds of sulfur dioxide emissions. (c) 500,000 standard cubic feet of vent gas combusted. The analysis shall identify the cause and duration of the flare event and describe any mitigation and corrective action taken to prevent recurrence of a similar flare event in the future. Unless an extension is granted, the owner/operator shall submit Specific Cause Analysis to the Executive Officer within 30 days of the event.
15. The owner/operator shall conduct an analysis and determine the relative cause for a flare event that results in combustion of more than 5,000 standard cubic feet of vent gas. A Specific Cause Analysis may be submitted to satisfy this condition.
16. The owner/operator shall submit a complete Flare Minimization Plan for approval of the Executive Officer no later than 90 days from the end of a calendar year in which flare emissions exceeding the annual performance targets set by Rule 1118(d)(1). The plan shall comply with the requirements of Rule 1118(e).

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17. The owner or operator shall maintain records in a manner approved by the Executive Officer for the following.
 - a. Flare event data collected pursuant to paragraph (g)(3), (g)(4), (g)(5), (g)(6) and subparagraph (g)(8)(C) of Rule 1118 as applicable.
 - b. Total daily and quarterly emissions of criteria pollutant from each flare and each flare event along with all information specified by Rule 1118(i)(5)(B).
 - c. Monitoring records of water seal levels and closures of control valves.
 - d. Pilot flame failure report.
 - e. Planned and unplanned flare monitoring system downtime report that include date and time and explanation for taking the system out of service.
 - f. Information to substantiate any exemptions taken under Rule 1118(k).
 - g. Monitoring records of valve position for control valve 40-PV-28 pursuant to Condition No. 9.
 - h. Specific Cause Analysis completed pursuant to Condition No. 14.
 - i. Relative Cause Analysis completed pursuant to Condition No. 15.
 - j. Annual acoustical pressure relief device leak survey.
 - k. Annual sulfur dioxide emissions for all flares at the refinery normalized over the crude oil processing capacity in calendar year 2004.
 - l. Video records pursuant to Rule 1118(g)(7).

Within 30 days after the end of each calendar quarter, the owner/operator shall submit a quarterly report to the AQMD Refinery Compliance Team to the below address. Items (a) through (i) shall be submitted quarterly in electronic format. Hard copy of item (j) shall be submitted with the quarterly report for the quarter which the survey was conducted. Hard copy of item (k) shall be submitted with the last quarterly report for the year. Item (l) shall be made available to the Executive Officer upon request.

All records required by this condition shall be certified for accuracy in writing by the responsible facility official and maintained for at least five years.

SOUTH COAST AIR QUALITY MGMT DISTRICT
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18. The owner/operator shall comply with all provisions of this approved Revised Flare Monitoring and Recording Plan unless the plan is suspended, revoked, modified, reissued, or denied, as well as all other applicable requirements of Rule 1118. Violation of any of the terms of the plan is a violation of Rule 1118.